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Riyadh Transportation History and Developing Vision

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Abstract

Riyadh is the capital city of the Kingdom of Saudi Arabia. It is both a rapidly moving microcosm of worldwide trends in transportation, and a unique case study. The aim of this study is to investigate the reasons behind rising car ownership and its impact on public transportation. This paper charts the historical development of the city and presents the key factors that have shaped the transport network, including governmental motivation, urban planning and financial and demographic aspects. The study reviewed the history of the Riyadh transportation system and either component during the last five decades and the factors that have made Riyadh's situation unique. From oasis to Metropolis there are many pressing issues. Resolving these requires much more than narrow technical solutions. Instead, consideration of a much broader range of factors is needed. Riyadh is presented as a city case study and the key challenges are illuminated.

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Keywords: Transportation, Public Transport, Car ownership, Urban planning, Urban sprawl, Riyadh, Saudi Arabia,

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1. Introduction

Since early this decade the planning authority of Riyadh has begun to devote serious consideration to providing an alternative to the private car and reducing automobile dependency, despite the fact that neither oil supply nor funding for extra roads are issues for the city (ADA 1999, 2003). Due to increasing car ownership, traffic congestion is becoming a serious problem and introducing public transport is being considered by the planning authority as a way of reducing traffic congestion and meeting the future travel requirements of the city (ADA 1999, 2003, 2004). This paper will present the key factors that have contributed to the city of Riyadh's current situation. However, Riyadh's Islamic culture and conventions regarding privacy have had a profound effect on the development of the transport system. Furthermore, the government has invested in huge projects and redevelopment of the city. An analysis follows of the impact of urban planning stages, key government plans and the vision underlying planning organizations in Saudi Arabia.

1.1. From oasis to metropolis

Files Within 50 years Saudi Arabia's capital city Riyadh has developed from a walled town into a metropolis of 5.5 million people. Riyadh has become a car-oriented city since the 1950s and the economic boom compounded this in the 1970s. Riyadh has witnessed tremendous growth in automobile dependence in the last few decades. According to Al-Mosaind (2001:4) between 1968 and 1996 the total number of automobiles in use increased from 26,880 to an estimated 670,300. The average vehicle ownership per household also increased nearly two and a half times during the same period (Al-Dubikhi 2007).

"For example, forty years ago the population of the city of Riyadh was just 100,000. Now it is 7 million, 61 per cent of which are Saudi citizens (Al-Hathloul 2002). The majority of expatriates living and working in the city are from Asian countries. There are also workers from Arab countries including Yemen, Egypt, Sudan, Lebanon and Syria. Moreover, European, North American, South Africans, Russian, Antipodeans and Chinese foreign personnels are engaged in a vast range of new infrastructure projects. Riyadh has become one of the most cosmopolitan cities in the Arab world. A wide range of cuisines can be found in the city's many eateries"

2. Public Transportation and car ownership history

2.1. Public transportation

The Saudi Arabian Public Transport Company (SAPTCO) was established in 1979 as a public company, with a government subsidy. It has been the regional and national public transit operator with a monopoly on transit services within and between Saudi cities. However, in Riyadh, despite the granted monopoly, private operators still provide deregulated transit services across the city and have done so since the 1960s, creating competition for SAPTCO (Al-Dubikhi 2007). AlGadhi (1994:14) concludes that `poor performance by SAPTCO' constitutes a greater obstacle to a more efficient transport system than the fierce competition from unregulated bus services, or jitneys as they are known locally. These vehicles operate on major roads and have a distinctive design: the chassis is white, with an orange line in the middle and a blue, green or maroon lower half (Alomran 2015).

Women constitute less than 9 percent of the total SAPTCO ridership. Service coverage and the lack of regard to privacy are two reasons for the low female ridership in SAPTCO buses. Jitneys do not carry women and the only culturally acceptable independent means of travel for women and girls is provided by the taxi service in the city (ADA 1997:86). Although it is not against the law for women to drive in Saudi Arabia, the country's Islamic establishment enforces a ban. It is the law in Saudi Arabia that every woman must have a male guardian. This is often a relative or the woman's husband. A guardian accompanies the woman everywhere and traditionally gives her permission to to engage in activities such as opening a bank account (BBC 2013). The availability of private cars and drivers was one of the reasons women avoid using public transport. All businesswomen and female students depend on their own private chauffeurs or taxi drivers. It is beyond the scope of this short paper to dwell on the

complex cultural issues and gender politics relating to this situation; suffice to say that the 'public' nature of public transport renders it inherently unattractive for female users in this society.

2.2. Car ownership

The city of Riyadh, as the capital of the Kingdom of Saudi Arabia, has experienced tremendous economic and population growth, particularly in the late twentieth century. Today, it is not only the economic centre of the Central Region and the Capital of the Kingdom but also the largest metropolitan area in Saudi Arabia and among the Gulf states. Riyadh, like all metropolitan cities, has diverse social, economic and demographic features that contribute to its unique character. Allied to the growth in economic activity and population has been an increase in mobility. This has generated high levels of car ownership and car use and in turn this has led to the construction of a series of expressways and arterial roads across the city. In the past, these have enabled high expectations of easy mobility to be met under the rubric of a dominant 'predict and provide' philosophy. This pattern of growth is expected to prevail over the next two to three decades.

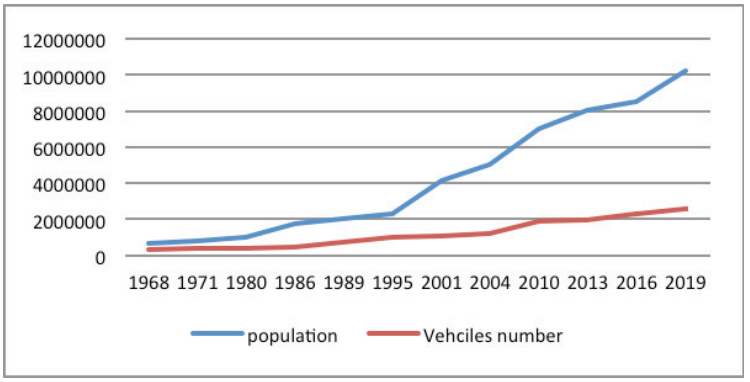

Figure 1 population and car ownership in Riyadh 1968-2021

Riyadh is a microcosm of the challenges experienced by
many cities in that there is finite available capacity, even in a comparatively new city sited in a desert. The inner areas of the city are particularly constrained in their ability to accommodate further expansion of the highway infrastructure. Meanwhile, expectations of high mobility coupled with the continued expansion of car use and ownership present significant implications for land use and transportation systems. In view of the growing car ownership and automobile dependency in Riyadh, maintaining adequate mobility in a reliable, safe and sustainable manner has become a key challenge. It is evident that a continuation of the present trends will lead to serious negative implications in both economic and environmental terms. Based on current trends, the available studies forecast that by 2020 the resident population could increase to over 15 million persons and the road capacity needed to maintain existing levels of service on the road network is unsustainable.

3. Urban sprawl

In the 1970s Saudi Arabia began to experience an economic boom due to the exploitation of the country's considerable oil reserves, which resulted in an increase in the urban area of cities, particularly Riyadh. Consequently, several master plans were implemented to cope with future growth: the Doxiadis Master Plan in 1972, the SCET plan in 1981, and MEDSTAR in 2001 (Al-Dubikhi 2007).

Table 1 spatial expansion and urban area in Riyadh 1966-2008

Year	Urban area (ha)	Spatial expansion
1966	19.315	-
1971	19.84	525
1982	33.4	13.56
1994	43.739	10.339
2002	49.8	10.061
2008	57.18	7.38

3.1. City ring roads and improvement of the road network

The Doxiadis Master Plan for Riyadh adopted the car as the main means of transportation. Thus, streets were designed in a hierarchical pattern that included freeways that link the city with other regions in the kingdom; expressways that serve high-speed traffic inside the city of Riyadh; arterial streets that serve heavy traffic inside the city; collector streets that link the neighbourhoods together; and local streets that traverse neighbourhoods. (Al-Hathloul 2002:5).

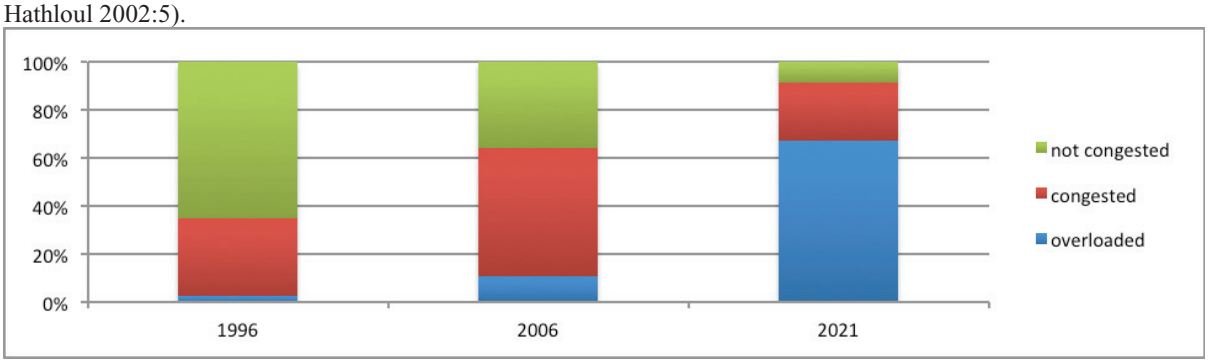

Figure 2: Overloade and congested Arterials with service roads in Riyadh 1996 to 2021

So-called 'activity spines' were proposed along the major highways to link the sub-centres with the Central Business District (CBD) to ensure the vitality of those sub-centres. According to the traffic patterns and distribution in Riyadh, there is a high rate of internal journeys existing within several sub-municipalities (ADA 1997c). This raises the question of why is there a need to locate sub-centres along freeways. In response to this critical question, in Phase II of the MEDSTAR project and during the process of selecting a preferred option, the study states that the consolidated pattern of development would be public transport oriented (ADA 1998). As a result, in a marginal point, Phase II proposes a bus, light rail, or monorail system that links the sub-centres with the central metropolitan area of Riyadh. Thus, activity spines have been selected, among other things, to encourage the use of the transit system along the spines. However, this vital suggestion of an adequate transit system was excluded from the final city structure plan (ADA 1999) at the end of Phase II in late 1999. Instead, various freeways were proposed for current and future urban development while the implementation of both a transit system and sub-centres is still lagging behind (Al-Dubikhi 2007).

3.1.1. City centre shift from Malaz to the north

In the 1940s the first automobile road was built, a paved stone road linking another large palace and administrative complex two kilometres north of the existing city, Qasr Al-Murabba (Al-Hathloul 2002:1). Between the 1940s and the late 1950s the major roads of the old town were widened to provide access for motor vehicles, despite the low auto ownership at the time. In addition to the new government building and employment areas in Al-Malaz and the royal complex in Al-Nasriyahy in 1950s, an inter-city railway station was constructed 4 kilometres east of the old city in 1951 and an airport was built 7 kilometres north of the old city in 1952 (Al-Hathloul 2002).

These developments affected the urban form of the city and were linked by a road network, driving the city to greater levels of dependence on the private car. The city was transformed from a traditional pedestrian environment to an automobile-dependent city without experiencing the transit city urban form as experienced in most European cities (Newman and Kenworthy 1999:27-33)

3.1.2. North attractive city centre

In Riyadh, Doxiadis adapted the idea to the car in 1972. In Riyadh the proposed activity spines are serviced by mass freeways that may undermine the "self-containment", and thereby may increase the overall demand for travel to be served more efficiently, mainly by private transport and the improbable public transport (Al-Dubikhi 2007). In theory the activity spines concept stands opposed to the sub-centres concept. However, the proposed locations of sub-centres are in fact the main contradiction in the rationale of district centres. This is because these freeway networks would encourage people to travel back and forth to district centres instead of living within their boundaries as MEDSTAR proposed (Al-Dubikhi 2007).

4. Causal factors leading to an increase in private car ownership:

Saudi cities resemble American patterns of urban development and transportation more closely than those in Western Europe. Many cities, especially in North America, have decentralised homes and jobs, leading to growth in suburb-to-suburb commuting and a corresponding shift from public transportation to the car (Cervero 2005). Cities in oil-producing developing countries have experienced a similar trend but most of them did not have public transport systems before the introduction of automobiles. Riyadh can be seen as a classic example of an urban environment designed solely around an infrastructure based on the automobile. In contrast to most American cities, where urban transport policy is still focused on the private car, many cities in Europe have managed to provide viable public transport options even for the suburb-to-suburb commuter (Vuchic 1999, 2005; Newman and Kenworthy 1999).

4.1. Petrol supporting

Governmental decrees by the Saudi royalty have contributed in a number of ways to issues of sprawling, unequal development and a general lack of sustainable planning to accommodate the city's growth. The oil boom period of the city made millions of dollars available to the government to allow for continued development. The expansion of much-needed services became part of the plan (Mubarak 2004).

In the case of Riyadh, the social dimension for providing public transport is more important than some issues that receive more attention in western cities. The main reason for this is that oil supply is not an issue in Saudi Arabia (Al-Dubikhi 2007).

4.2. Economic aspects

An important reason why Riyadh is a car-based city is that people with access to cars simply never use public transport: upper, middle and even working class Saudi residents tell visitors that public transport is for the foreign blue-collar workers only (Al-Dubikhi 2007).

Riyadh is following the Western [OR 'the North American] example in terms of automobile dependency. The phrase that "many people have built their way of life around their cars" is absolutely true in Riyadh. Shopping trips usually entail driving and[,] in Riyadh, people shop wherever their car can gain access (Alskait et al. 1997:49)

In terms of the economic aspects, Saudi Arabia has experienced continued economic growth, attracting migration from within the country and from foreign countries, mainly blue-collar workers. One third of the city's population consists of expatriates with fixed-term contracts and a large proportion of them are not allowed to drive (Al-Dubikhi 2007). Due to the nature of their employment contracts and conditions these people have to travel in private buses or trucks. However, as the Saudi younger generation has begun to join the workforce, a national movement known as Saudisation has become widespread over the past decade (Al-Dubikhi 2007). Saudisation refers to the national strategy to replace foreign labour with Saudi workers by supporting the private sector.

This may result in less dependence on economic immigrants, particularly in management and professional positions; thus, travel behaviour would change and daily trips would increase (Al-Dubikhi 2007).

4.3. Governmental motivation

The city outskirts of the 1970s were located approximately half the radial distance from the city center compared to the boundaries of today. Agriculture and large land plots also hindered expansion. The Ministry of Agriculture contributed to the city sprawl by setting aside inadequate land-areas for agricultural use.

In 1997 vehicle ownership rates per 1000 persons were 224 (ADA 1997c:85) which is relatively low in comparison with international cities. Major metropolitan cities in the US have an average of 604 cars per 1000 people, while Australia averages 491, Canada 524, and Europe 392 (Kenworthy and Laube1999:529). However, a defining feature of automobile use in Riyadh is its trajectory. The Kingdom of Saudi Arabia (KSA) had no more than 22,805 cars in 1971. This number reached 2,052,934 cars in 1996 (Ministry of Interior (MOI), 1996). According to the latest statistics in 2008, the number has reached 6,800,000 cars (GAT Website, 2008). The continuous growth in car ownership is exacerbated by low car operating costs. By global standards, car taxation in KSA is negligible: the registration charge is just 250 SAR and fuel prices are especially low (at the time of writing a litre of unleaded petrol costs just 0.63 SAR). While private cars cannot be used by all segments of society, they are affordable to many people on a lower income, and this largely compensates for the lack of an effective public transport system (Alfoazn 2011).

ADA (1997c:85) and Al-Mosaind (2001) attribute the relatively low rate of car ownership in Riyadh to four factors: (1) the age profile, since a significantly higher average proportion of the population is below driving age; (2) the average household size of 6.1 persons; (3) the fact that women and a proportion of the expatriate workforce are not allowed to drive; and (4) some of the ownership rates for international cities may include total vehicle fleets rather than just those vehicles available to households. In the future, according to Riyadh Development Authority ADA (1997c:84) the rate of vehicle ownership `could increase as a result [of] changes in factors such as age structure of population, household formation, wealth and urban sprawl.', further accelerating Riyadh's traffic growth.

4.4. Walking and the effects of the climate

High car dependence is in large part determined by the climatic conditions. Summer temperatures in Riyadh reach 57 degrees in the summer resulting in a low proportion of trips made by walking or other outdoor means. Correspondingly, the pedestrian environment is a not well developed, with limited or no provision for sidewalks in most instances along major roads and discontinuous sidewalk where they are provided. It is very difficult for pedestrians to cross streets, given the very wide intersection spacing, high speed and volume of traffic and the general lack of provision for pedestrians at signalised intersections (Alfozan 2011). Riyadh is following many western nations, most notably the United States and North America, in terms of automobile dependency. The phrase that "many people have built their way of life around their cars" is visibly manifest in Riyadh. Shopping trips usually entail driving and in Riyadh, people shop wherever their car can gain access. [Alskait et al. 1997:49]

4.5. Privacy and demographic factors

Society, demography and culture are unique in Riyadh, and a central role in the development of Riyadh's transport networks. A defining feature is that women in Saudi Arabia are not permitted to drive and therefore rely on male relatives, expatriate male private drivers and taxis, resulting in large numbers of trips per Saudi household. In Saudi culture, females and males are always segregated on urban buses and are usually transported separately on group transportation services. Because of this tradition, females expect a door-to-door service which public transport, generally, is ill-equipped to provide (Alfozan 2011)

Trips made by males aged 16 and over are higher than females in a similar age category. For all travel purposes, the daily adult male vehicle trip rate was 2.78 per person in 1986 while for women and for school-age children aged

5-15 years old it was 0.58 and 0.87, respectively (ADA 1997c:86-87; 2003:19). The ADA (1997; 2003) expressed concern over this significant difference despite today's semi-restrictive social conditions on female travel, and higher female participation rates in employment and education compared to 1986. The ADA claims that the number of trips made by women may have been under-reported. However, based on the most recent estimate of the current situation in Riyadh, the ADA (2004:21) states that `Saudi households generate a large number of trips, partially to meet the needs of the female members who are usually reliant on male household drivers (Al-Dubikhi 2007). For religious and cultural reasons women are unlikely to be allowed to drive in Saudi Arabia for the foreseeable future, leaving the entire family highly dependent on adult males for travel (Al-Dubikhi 2007).

There is also a prominent demographic aspect to Riyadh's transport needs. Half of the city's population are under the age of 18 and hence below the legal driving age. In the very near future they will grow up, which is likely to result in increasing car numbers. Another demographic issue that is expected to lead to more daily trips is the anticipated population growth; The population of 5 million in 2006 is expected to soar to 20 million by 2020 (ADA 2003:19).

4.6. The problem with public transport in Saudi Arabia

The 1977 public transport study by Doxiadis anticipated that transit modal split would reach 45% by 1980, but fall to 25% by 1991, based on the experiences of similar cities (Doxiadis Associates International 1977:22; Al-Mosaind and AlGadhi 2002). In actual fact, by 1989 it was merely 1.6%. The study was one of the motivations behind the foundation of SAPTCO in 1979 which, as discussed above, has suffered from competition from privately operated minibuses (Al-Dubikhi 2007). The consequences of this exceedingly small public transport modal split are hardship among population groups such as teenagers, the elderly, tourists, choice transit riders, and others; it has also resulted in serious environmental deterioration in the urban area. Consequently, large cities that rely solely on cars and commuter transit are at a serious competitive disadvantage in comparison with cities that have efficient regular transit services, even if the car has a dominant role. [Vuchic 1999:49]

For the reason presented above, despite Riyadh having a first-rate road network, traffic congestion is often more serious than in the cities of other developed countries. Traffic congestion, due to increasing car ownership, is becoming a serious problem in Riyadh. Public transport can make a positive contribution to overcoming this problem by providing another alternative to the private car. Experience has shown that transit has great significance for reducing traffic congestion, offering alternative means of travel, and contributing greatly to the quality of urban life. (Vuchic 2005:xiii). This need is keenly felt in Riyadh and the Metropolitan Development Strategy has therefore suggested the need for adequate public transport for Riyadh (MEDSTAR 2012) as a remedial measure beside high capacity road provision (ADA 1999:173-190).

5. Future plans for Transportation

Today in Riyadh there is clear evidence that demand exceeds road space capacity. Extensive and sometimes prolonged traffic congestion exists every weekday on parts of the Makkah Expressway and King Fahad Freeway, including the majority of arterial roads in central Riyadh. The Riyadh Development Authority [ADA] has undertaken various studies on the developmental needs of the city through the ongoing MEDSTAR [Metropolitan Development Strategy for Riyadh] project. MEDSTAR addresses the strategic planning needs for Riyadh and has recognized that the success of the expected planning outcomes will be contingent upon having a coherent strategy that supports urban mobility. In turn, high quality public transport is an important element of the mobility strategy that contributes to maintaining the economic prosperity of Riyadh. It follows that there is a need to identify a public transport system appropriate to this large and culturally unique city (Al-Dubikhi 2007).

Since September 2004 the Canadian firm IBI Group has been working on the Riyadh Comprehensive Public Transport Plan. The ADA predicted that this plan would be completed by mid-2006. It is important to note that the concept of a comprehensive transit study for Riyadh was proposed initially by the Ministry of Transport in 2002 (Al-Mosaind and AlGadhi 2002); however, due to a limited budget for transit studies and the transit system the study could not be carried out by the Ministry (Al-Dubikhi 2007).

Ironically, the Ministry of Transport devotes almost all its budget to maintaining the current road networks and building more freeways (Al-Dubikhi 2007). However, this unsustainable trend is unlikely to continue, particularly after the Council of Ministers authorised the Ministry of Transport in 2003 to carry out comprehensive public transport studies not only in Riyadh, but in all Saudi cities, regardless of size. Interestingly, the Ministry wrote back to the Council seeking a specific budget to cover the consultation work to conduct transit studies for all places except Riyadh, as it is under the authority of ADA. A response from the Council is expected in the near future (middle of 2006) to implement transit studies for the Saudi cities, marking a significant change in transportation policy from a continued dependency on automobiles (Al-Dubikhi 2007). It is thus an exciting time for transportation research in Riyadh.

Riyadh metro is a rapid transit system under construction in Riyadh, Saudi Arabia. The metro is a part of the Riyadh Public Transport Project (RPTP). The RPTP will be the largest public transport project, which comprises construction of a metro, a bus system and other transport services in Riyadh. Construction of the Riyadh metro started in April 2014 and is expected to be completed by 2018. The metro project will be owned and operated by the Arriyadh Development Authority (ADA). The project will have an execution period of five years and an optional maintenance service period for the next ten years. It is expected to create about 15,000 jobs in Saudi Arabia.(railway-technology)

6. Discussion and conclusion

Regarding the future of Riyadh's transport system, Al-Dubikhi (2007) predicts that a new Public Transport System will be constructed, consisting of a Metro of six inter-connecting lines, integrated with a Bus Rapid Transit network and using dedicated highway lanes. The aim is to revolutionize the way in which the people of Riyadh, and the hundreds of thousands of visitors who come each year, will travel around the capital. It is hoped that by 2020, when the Public Transport System has become fully operational and citizens have become used to its immense advantages, the capital's roads will be markedly less congested. The expectation is that the minority who still feel the need to travel by car will experience faster journeys, generally free of the frustrations of traffic jams. Researchers in transportation and urban studies are invited to consider whether and by what means these aspirations can actually be met, and what lessons can be learnt from other international case studies.

The standpoint of the research from which this paper stems is that Riyadh is in many ways unique, but is at the same time a microcosm of worldwide trends. What emerges from Riyadh's developmental history and future is the need to go beyond conventional engineering solutions to instead consider the 'whole-system' effects of engineering, people, society and culture.

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